

include maintenance instructions that provide specifications for periodic replacement or refurbishment.

(iii) Provide positive pressure and an automatic means to assure that the pressure is relieved at 0.18 psi, or as specified by the manufacturer, above mine atmospheric pressure in the refuge alternative.

(iv) Include warnings to assure that only uncontaminated breathable air is supplied to the refuge alternative.

(v) Include air lines to supply breathable air from the fan or compressor to the refuge alternative.

(A) Air lines shall be capable of preventing or removing water accumulation.

(B) Air lines shall be designed and protected to prevent damage during normal mining operations, a flash fire of 300 °F for 3 seconds, a pressure wave of 15 psi overpressure for 0.2 seconds, and ground failure.

(vi) Assure that harmful or explosive gases, water, and other materials cannot enter the breathable air.

(2) Redundant fans or compressors and power sources shall be provided to permit prompt re-activation of equipment in the event of failure.

(d) Compressed breathable oxygen shall—

(1) Include instructions for deployment and operation;

(2) Provide oxygen at a minimum flow rate of 1.32 cubic feet per hour per person;

(3) Include a means to readily regulate the pressure and volume of the compressed oxygen;

(4) Include an independent regulator as a backup in case of failure; and

(5) Be used only with regulators, piping, and other equipment that is certified and maintained to prevent ignition or combustion.

(e) The applicant shall prepare and submit an analysis or study demonstrating that the breathable air component will not cause an ignition.

(1) The analysis or study shall specifically address oxygen fire hazards and fire hazards from chemicals used for removal of carbon dioxide.

(2) The analysis or study shall identify the means used to prevent any ignition source.

§ 7.507 Air-monitoring components.

(a) Each refuge alternative shall have an air-monitoring component that provides persons inside with the ability to determine the concentrations of carbon dioxide, carbon monoxide, oxygen, and methane, inside and outside the structure, including the airlock.

(b) Refuge alternatives designed for use in mines with a history of harmful gases, other than carbon monoxide, carbon dioxide, and methane, shall be equipped to measure the harmful gases' concentrations.

(c) The air-monitoring component shall be inspected or tested and the test results shall be included in the application.

(d) The air-monitoring component shall meet the following:

(1) The total measurement error, including the cross-sensitivity to other gases, shall not exceed ± 10 percent of the reading, except as specified in the approval.

(2) The measurement error limits shall not be exceeded after start-up, after 8 hours of continuous operation, after 96 hours of storage, and after exposure to atmospheres with a carbon monoxide concentration of 999 ppm (full-scale), a carbon dioxide concentration of 3 percent, and full-scale concentrations of other gases.

(3) Calibration gas values shall be traceable to the National Institute for Standards and Technology (NIST) "Standard Reference Materials" (SRMs).

(4) The analytical accuracy of the calibration gas and span gas values shall be within 2.0 percent of NIST gas standards.

(5) The detectors shall be capable of being kept fully charged and ready for immediate use.

§ 7.508 Harmful gas removal components.

(a) Each refuge alternative shall include means for removing harmful gases.

(1) Purging or other effective procedures shall be provided for the airlock to dilute the carbon monoxide concentration to 25 ppm or less and the methane concentration to 1.0 percent